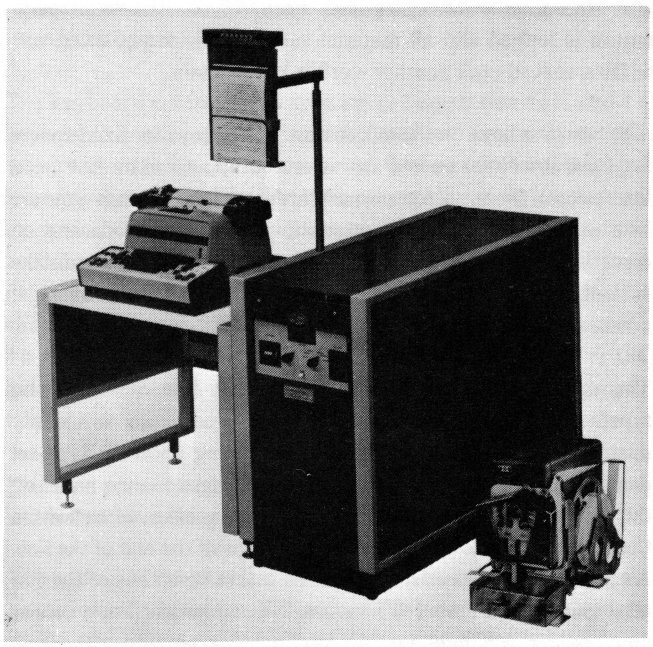
The computer keyboard

R. D. Kodis

The objective in designing the computer keyboard typesetting machine was to tackle the problem areas of a composing room that represented significantly costly man-hours. The system should: Reduce the skill levels and training time required of the operator—Speed up the keyboarding operation by reducing the number of keystrokes to be made, providing an implementation which permits higher-speed keying, easy and fast error correction to reduce the number of errors in the punched tape, and to provide equipment for monitoring collective classes of errors and eliminating them at the time of keyboarding—Produce as an output a perfect justified tape with no rub-outs, no tight or loose lines and a minimum of typographic errors—Provide format control for all typographic functions with a single key-stroke, also for functions such as quoting, inserting leader dots or inserting blank space—Provide a one-step process for the generation of this perfect justified tape to eliminate the delays and cost of multi-step processing as well as the cost and maintenance problems with the multi-uses of readers, and punches—Provide equipment which can be maintained and operated by the personnel employed in the composing room without the addition of any 'foreign' personnel, that is to be able to retrain manual linecasting operators and TTS operators as well as using the present machinists for maintenance.

The original designs incorporated many brave speeches which could not stand the test of the market place. The customer we found, or believed, would not be willing to pay the additional price which those speeches implied. In 1963 real specifications were drawn up and engineering of the product began. Late in 1964 units now labelled as Model 1 were produced and installed in the field. With the knowledge gained during the year 1964 and experience with the Model 1, additional features were added to the machine and with some redesign, a Model 2 was put into production in modest quantity in 1965. Simultaneously a major redesign to incorporate features which were not possible to get into the Model 2 was started with the major objective of lowering the price. The Model 3 was engineered during 1965. Production units came forth this spring and have been installed in newspapers in the United States.

The Di/An computer keyboard consists of a standard Teletype Burpy punch, modified by Di/An, and on a remote cable from a special purpose computer which is fed by a keyboard. The punch can be remote from the keyboard and computer because the operator never needs to see the punched tape or learn to read the tape codes. This is because the keyboarding is going directly into the computer memory and not to the punched tape. The computer puts out a justified line at a time to the tape. This permits the operator to have access and correct the line in any



way before it is on the tape. These corrections are made by two keys. The kill-line key from one keystroke completely eliminates the line as if it had never been inserted into the machine. The other key called the back-space key has two functions. Tapping it once removes the last character from the memory and the calculations. Holding it down will remove the last word including the space before it. Tapping it and holding it down again will remove another word, and so on. Each time a character is erased the keyboard prints a bracket around that character to indicate to the operator that it actually has been erased. The operator may then proceed to type over the original material on the hard copy or, since the carriage has no connection with the electronics, the paper can be rolled up to show the correction in the clear. Line measure is set on a small control panel on the front of the computer at the operator's right hand, and the panel also selects typeface, indent, quadding and centering. There is also a line counter which indicates the number of good lines sent out to the tape. This can be located remotely if desired. The keyboard is an Underwood typewriter modified to make it more maintainable and rugged. The additional function keys to the left and right of the standard electric keyboard layout are at the same level and are easily reached and operated at high speed by the operator. On the right, keys generate flush left, flush right or centering from one keystroke as well as 'insert leader dots' and 'insert blank space' in a line from one keystroke. These five keys are backed up by the computer which does the entire calculation and inserts the appropriate amount of characters and spaces in

the appropriate place in the line. Other function keys on the right are the stop code, which will stop the typesetting machine, for permitting operations to be performed by a monitor where the typesetting machine cannot be instructed by appropriate tape codes. A tape-feed switch automatically produces a measured blank leader of 10″ of tape. A tape alarm light indicates any problems with the remote punch, such as running out of paper. The machine will not run unless the remote punch is suitably connected. A letterspace key permits automatic letterspacing, one word at a time. When it is desired to letterspace a word after the inter-word space has been keyed, the letterspace button is tapped and all material subsequently keyboarded will be letterspaced until another word is keyed again.

The function keys on the left consist of five keys for fixed spaces for (one at a time) control of lower and upper rail on hot metal linecasters. The auto-release switch determines whether you are in a manual mode or an automatic justification mode and an error light which goes on for various classes of errors in the system alerts the operator and the maintenance personnel, if necessary.

The normal mode of operation is to set line measure, and typeface, and to proceed keyboarding. The computer will justify most material on inter-word space depending upon the type-set density desired. A switch control on the maintenance panel on the side of the unit permits automatic release when within three ens of the end of the line, or seven ens of the end of the line. As the line is keyboarded and comes within seven ens of the end of the line, the number 7 in a small incandescent lamp on the copy holder will light up. As keyboarding continues this will move along showing the remaining line deficit. If the operator is at that point in the middle of a large word he can hyphenate and this will automatically release the line. If he does not hyphenate and the line does not justify on an inter-word space, the line will become overset and the keyboard will lock. He can either kill the line or back space the appropriate number of characters and then hyphenate. In no case will the machine ever release a line which is loose or tight. The operator can manually release a line if desired when in a justified range before the computer releases it.

Also on the maintenance panel is another toggle switch which permits the operator or management to determine whether the tape shall be prepared for hot metal machines with Auto-Quadder or whether the tape shall contain all the necessary codes.

Practical experience

The basic impact of a computer keyboard on the newspaper composing rooms where it is installed has been to reduce the number of keyboard operators, the number of tape-operated linecaster monitors, the number of proofreaders and the number of manual linecasting operators making corrections. The computer keyboard can be operated by a typist who can produce high quality work with a few hours' training. It offers productive levels well above previous keyboarding methods in two weeks. Most of the current operators of computer keyboards are re-trained manual linecasting operators and ex-TTS keyboard operators.

The manual lino-operators were generally older men and were not turned into very efficient typists. However, on average they approached three times the productivity they had shown at the manual linecaster. In the case of TTS operators initial training was even more difficult during the first few days since they had to unlearn some key combinations such as 'shift', 'unshift', etc. which were not required on the computer keyboard. Subsequently, however, their keyboarding experience stood them in good stead and in general they have gone at about twice the speed on the computer keyboard than they had on the TTS keyboard. An interesting development is that since error correction is easy and fast and no evidence appears on the punched tape, the operators become more sensitive to creating possible errors and will correct more of them. It is obvious that this is the 'lowest cost place' to find and correct the errors generated by the operator. Productive rates vary considerably from operator to operator and installation to installation, depending upon management policy. We have experienced overall rates per hour, including breaks for coffee, of from 16,000 to 24,000 keystrokes per hour on straight matter eleven-pica lines. If the material is largely quoted or filled with leader dots, considerably higher rates can be produced since the bulk of the codes are produced by the machine, not the operator. Hyphenation is not a particularly time-consuming function for the operator.

The system monitors the operator for certain wrong operations such as striking two keys at the same time, putting a spaceband against a jaw or two spaces together in a hot metal operation. Where two keys are struck, the electric interlock on the keyboard will be put into action and the operator cannot proceed until the back space key is struck and the error removed. In the case of double spacebands the system will just ignore the second or more spaceband or bands, put either at the beginning or end of the line.

One of the advantages of the present system design is that the integrated keyboard computer system avoids the need for back-up in the composing room and is never vulnerable to down time such as when a single central processor is utilised. It is difficult if not even costly to get a central processor to provide all the functions at present being supplied in this unitised system.

Perfect tapes are generated. There are no rub-outs, no tight or loose lines, and there is a drastic reduction in typographic errors. The objective of being able to format typographic functions with a single keystroke has been met for a number of such formats, but we have not attempted to provide internal programs for every such function. Meantime between failures on the electronics is in excess of 20,000 hours. The keyboard does require routine maintenance and adjustment and is subject to wear-out. The punch is standard and requires routine adjustment and cleaning, and is subject to wear-out.